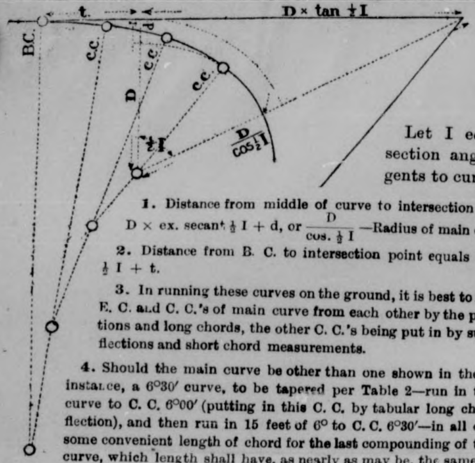
0188

(10-4-02—1M)

2 G 162

DIAGRAM

Showing "D," "d," "t" of Tapering-Curve Tables.



Let I equal intersection angle of tangents to curve, then:

1. Distance from middle of curve to intersection point equals D × ex. secant ½ I + d, or $\frac{D}{\cos.\ \frac{1}{2}I}$ —Radius of main curve.

2. Distance from B. C. to intersection point equals D × tangent ½ I + t.

3. In running these curves on the ground, it is best to fix the B. C., E. C. and C. C.'s of main curve from each other by the proper deflections and long chords, the other C. C.'s being put in by successive deflections and short chord measurements.

4. Should the main curve be other than one shown in the tables—for instance, a 6°30′ curve, to be tapered per Table 2—run in the tapering curve to C. C. 6°00′ (putting in this C. C. by tabular long chord and deflection), and then run in 15 feet of 6° to C. C. 6°30′—in all cases taking some convenient length of chord for the last compounding of the tapering curve, which length shall have, as nearly as may be, the same relation to the tabular chord length as the main curve bears to the adjacent tabular curves. Get corrected values of D and t by multiplying cosine and sine of total curvature up to main curve by the difference of radii of main curve and of last branch of compound curve; subtract cosine product from D, and add sine product to t (as taken from the table for the last branch of the compound curve).

FOR TABLE ½.

Degree of Main Curve.	"D."	"t."	Total Curvature in Tapering Curve at Each End of Main Curve.	"d" = "D," less Radius of Main Curve.	Long Chord from B. C. of Taper to C. C. of Main Curve.
° ′			° ′		
0 30	11459.18	15.00	0 04½	0.01	30.00
0 45	7639.49	30.00	0 13½	0.04	60.00
1 00	5729.70	45.00	0 27	0.10	90.00
1 15	4583.88	60.00	0 45	0.20	120.00
1 30	3820.09	75.00	1 07½	0.34	150.00
1 45	3274.63	90.00	1 34½	0.55	179.99
2 00	2865.65	104.99	2 06	0.83	209.99
2 15	2547.70	119.99	2 42	1.18	239.98
2 30	2293.50	134.98	3 22½	1.62	269.96
2 45	2085.69	149.97	4 07½	2.16	299.93
3 00	1912.72	164.95	4 57	2.81	329.89
3 15	1766.58	179.92	5 51	3.57	359.84
3 30	1641.55	194.88	6 49½	4.47	389.76
3 45	1533.45	209.84	7 52½	5.49	419.65
4 00	1439.14	224.77	9 00	6.67	449.51
4 15	1356.21	239.69	10 12	8.00	479.33
4 30	1282.82	254.59	11 28½	9.50	509.10
4 45	1217.48	269.47	12 49½	11.17	538.81
5 00	1159.03	284.31	14 15	13.03.	568.45

RADII FOR 50 FEET CHORDS.

Degree.	Radius.	Degree.	Radius.
° ′		° ′	
0 15	22918.32	5 15	1091.45
0 30	11459.17	5 30	1041.84
0 45	7639.45	5 45	996.55
1 00	5729.61	6 00	955.04
1 15	4583.69	6 15	916.85
1 30	3819.74	6 30	881.59
1 45	3274.08	6 45	848.95
2 00	2864 84	7 00	818.64
2 15	2546 52	7 15	790.42
2 30	2291.88	7 30	764.08
2 45	2083.58	7 45	739.44
3 00	1909.91	8 00	716.34
3 15	1763.01	8 15	694.65
3 30	1637.09	8 30	674.22
3 45	1527.96	8 45	654.97
4 00	1432.47	9 00	636.78
4 15	1348.21	9 15	619.58
4 30	1273.32	9 30	603.29
4 45	1206.31	9 45	587.83
5 00	1146.01	10 00	573.14

TABLE ½. TAPERING CURVES—CHANGING 0°–15′ EACH 30 FEET.

Transit at	DEFLECTIONS TO																			
	B. C. 0° 15′	C. C. 0° 30′	C. C. 0° 45′	C. C. 1° 00′	C. C. 1° 15′	C. C. 1° 30′	C. C. 1° 45′	C. C. 2° 00′	C. C. 2° 15′	C. C. 2° 30′	C. C. 2° 45′	C. C. 3° 00′	C. C. 3° 15′	C. C. 3° 30′	C. C. 3° 45′	C. C. 4° 00′	C. C. 4° 15′	C. C. 4° 30′	C. C. 4° 45′	C. C. 5° 00′
° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
B. C. 0 15	...	0 02¼	0 05¾	0 10½	0 16¾	0 24¾	0 34¼	0 45	0 57½	1 11¼	1 26¾	1 43½	2 01¾	2 21¾	2 43	3 06	3 30¼	3 56¼	4 23½	4 52¼
C. C. 0 30	0 02¼	......	0 04½	0 10¼	0 17¼	0 25¾	0 36	0 47½	1 00¾	1 15¼	1 31½	1 49	2 08¼	2 28¾	2 51	3 14½	3 39¾	4 06¼	4 34½	5 04
C. C. 0 45	0 07¾	0 04½	......	0 06¾	0 14½	0 24	0 34¾	0 47¼	1 01¼	1 16½	1 33½	1 51¾	2 11½	2 33	2 55¾	3 20¼	3 46	4 13½	4 42¼	5 12¾
C. C. 1 00	0 16½	0 12½	0 06¾	....	0 09	0 19¼	0 30¾	0 43¾	0 58½	1 14¾	1 32¼	1 51½	2 12	2 34	2 57¾	3 22¾	3 49½	4 17½	4 47¼	5 18¼
C. C. 1 15	0 28¼	0 23¼	0 16¾	0 09	.....	0 11¼	0 23¾	0 37½	0 53	1 09¾	1 28	1 48	2 09½	2 32¼	2 56½	3 22½	3 49¾	4 18¾	4 49	5 21
C. C. 1 30	0 42¾	0 37¼	0 30	0 21¼	0 11¼	......	0 13½	0 28¼	0 44¼	1 02	1 21	1 41½	2 03¾	2 27¼	2 52½	3 19	3 47¼	4 16¾	4 48	5 20½
C. C. 1 45	1 00½	0 54	0 46	0 36¾	0 26	0 13½	......	0 15¾	0 32½	0 51	1 11	1 32¼	1 55	2 19½	2 45½	3 12¾	3 41½	4 12	4 43¾	5 17¼
C. C. 2 00	1 21	1 14	1 05¼	0 55¼	0 43½	0 30½	0 15¾	......	0 18	0 37¼	0 57¾	1 20	1 43½	2 08½	2 35¼	3 03¼	3 33	4 04	4 36¾	5 10¾
C. C. 2 15	1 44½	1 36¾	1 27¼	1 16½	1 04	0 50¼	0 34¾	0 18	......	0 20¼	0 41½	1 04½	1 29	1 54¾	2 22	2 51	3 21¼	3 53¼	4 26½	5 01½
C. C. 2 30	2 11¼	2 02¾	1 52½	1 41	1 27¾	1 13	0 57	0 39¼	0 20¼	......	0 22½	0 46¼	1 11¼	1 38	2 06	2 35½	3 06¾	3 39¼	4 13½	4 49
C. C. 2 45	2 41	2 31½	2 20¾	2 08¼	1 54½	1 39	1 22	1 03¾	0 44	0 22½	.....	0 24¾	0 50¾	1 18	1 46¾	2 17¼	2 49	3 22½	3 57¼	4 33¾
C. C. 3 00	3 13½	3 03½	2 51¾	2 38½	2 24	2 08	1 50¼	1 31	1 10½	0 48¼	0 24¾	......	0 27	0 55	1 24¾	1 55¾	2 28½	3 02¾	3 38¼	4 15¼
C. C. 3 15	3 49¼	3 38¼	3 26	3 12	2 56½	2 39¾	2 21½	2 01½	1 40	1 17¼	0 52¾	0 27	......	0 29¼	0 59¾	1 31½	2 04¾	2 39¾	3 16	3 54
C. C. 3 30	4 27¾	4 16¼	4 03	3 48½	3 32¼	3 14¾	2 55½	2 34¾	2 12¾	1 49¼	1 24	0 57½	0 29¼	......	0 31½	1 04	1 38¼	2 14	2 51	3 29½
C. C. 3 45	5 09½	4 57	4 43¼	4 27¾	4 11	3 52½	3 32½	3 11¼	2 48½	2 24	1 58¼	1 30¾	1 01¾	0 31½	......	0 33¾	1 08½	1 45	2 22¾	3 02¼
C. C. 4 00	5 54	5 41	5 26¼	5 10¼	4 52½	4 33½	4 12¾	3 50½	3 27	3 02	2 35¼	2 07¼	1 37½	1 06¼	0 33¾	......	0 36	1 13¼	1 51¾	2 32
C. C. 4 15	6 41¾	6 27¾	6 12½	5 55½	5 37¼	5 17¼	4 56	4 33	4 08¾	3 42¾	3 15½	2 46½	2 16	1 44¼	1 10¾	0 36	......	0 38¼	1 17½	1 58½
C. C. 4 30	7 32¼	7 17¾	7 01½	6 44	6 24¾	6 04¼	5 42	5 18½	4 53¼	4 26¾	3 58½	3 28¾	2 57¾	2 25	1 51	1 15¼	0 38¼	......	0 40½	1 22
C. C. 4 45	8 26	8 10½	7 53¾	7 35¼	7 15½	6 54	6 31¼	6 06¾	5 41	5 13½	4 44¾	4 14¼	3 42½	3 09	2 34¼	1 57¾	1 20	0 40½	..	0 42¾
C. C. 5 00	9 22¾	9 06½	8 48¾	8 29¾	8 09	7 47	7 23¼	6 58¼	6 31½	6 03½	5 33¾	5 02¾	4 30	3 55¾	3 20¼	2 43	2 04½	1 24¼	0 42¾	....

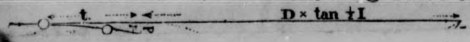
C. C. 2 30	0 56¼	0 46½	0 33¾	0 18	.....	0 22½	0 47¼	1 15	1 45¾	2 19½	2 50¼	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C. C. 3 00	1 25½	1 14¼	1 00	0 42¾	0 22½	.....	0 27	0 56½	1 28½	2 03¾	2 42	3 23¼	4 07½	4 54¾	5 45	6 38¼	7 34¼	8 33½	9 35¾	10 40¾
C. C. 3 30	2 00¾	1 48	1 32¼	1 13½	0 51¾	0 27	.....	0 31½	1 05¼	1 42	2 21¾	3 04½	3 50¼	4 39	5 30¾	6 25½	7 23¼	8 23¾	9 27½	10 34
C. C. 4 00	2 42	2 27¾	2 10½	1 50¼	1 27	1 00¾	0 31½	.....	0 36	1 14¼	1 55½	2 39¾	3 27	4 17½	5 10½	6 06¾	7 06	8 08	9 13¼	10 21½
C. C. 4 30	3 29½	3 13½	2 54¾	2 33	2 08¼	1 40½	1 09¾	0 36	.....	0 40½	1 23¾	2 09	2 57¾	3 49½	4 44¼	5 42	6 42¾	7 46½	8 53	10 02¾
C. C. 5 00	4 22½	4 05¼	3 45	3 21¾	2 55½	2 26¼	1 54	1 18¾	0 40½	.....	0 45	1 32¼	2 22½	3 15¾	4 12	5 11¼	6 13½	7 18¾	8 27	9 38
C. C. 5 30	5 21¾	5 03	4 41¼	4 16½	3 48¾	3 18	2 44¼	2 07½	1 27¾	0 45	.....	0 49½	1 41¼	2 36	3 33¾	4 34½	5 38¼	6 45	7 54¾	9 07½
C. C. 6 00	6 27	6 06¾	5 43½	5 17¼	4 48	4 15¾	3 40½	3 02¼	2 21	1 36¾	0 49½	.....	0 54	1 50½	2 49½	3 51¾	4 57	6 05¼	7 16½	8 30¾
C. C. 6 30	7 38¼	7 16½	6 51¾	6 24	5 53¼	5 19½	4 42¾	4 03	3 20¼	2 34½	1 45¾	0 54	.....	0 58½	1 59¼	3 03	4 09¾	5 19½	6 32¼	7 48
C. C. 7 00	8 55½	8 32¼	8 06	7 36¾	7 04½	6 29¼	5 51	5 09¾	4 25½	3 38¼	2 48	1 54¾	0 58½	.....	1 03	2 08¼	3 16½	4 27¾	5 42	6 59½
C. C. 7 30	10 19	9 54¼	9 26½	8 55½	8 21¾	7 45	7 05¼	6 22½	5 36¾	4 48	3 56¼	3 01½	2 03¾	1 03	.....	1 07½	2 17¼	3 30	4 45¾	6 04½
C. C. 8 00	11 48¼	11 22	10 52¾	10 20½	9 45	9 06¾	8 25½	7 41¼	6 54	6 03¾	5 10½	4 14¼	3 15	2 12¾	1 07½	.....	1 12	2 26¼	3 43½	5 03¾
C. C. 8 30	13 23¾	12 55¾	12 25	11 51¼	11 14½	10 34¾	9 51¾	9 06	8 17¼	7 25½	6 30¾	5 33	4 32¼	3 28½	2 21¾	1 12	...	1 16½	2 35¼	3 57
C. C. 9 00	15 05	14 35¾	14 03½	13 28	12 49¾	12 08½	11 24¼	10 37	9 46½	8 53¼	7 57	6 57¾	5 55½	4 50¼	3 42	2 30¾	1 16½	.....	1 21	2 44¼
C. C. 9 30	16 52½	16 21¾	15 47¼	15 11	14 31¼	13 48¼	13 02½	12 13¾	11 22	10 27	9 29¼	8 28½	7 24¾	6 18	5 08¼	3 55½	2 39¾	1 21	.....	1 25½
C. C. 10 00	18 46	18 13¾	17 38¼	17 00	16 18½	15 34¼	14 47	13 56½	13 03¼	12 07	11 07½	10 05¼	9 00	7 51¾	6 40½	5 26¼	4 09	2 48¾	1 25½	......

(10-4-02—1M)

2 G 162

DIAGRAM

Showing "D," "d," "t" of Tapering-Curve Tables.



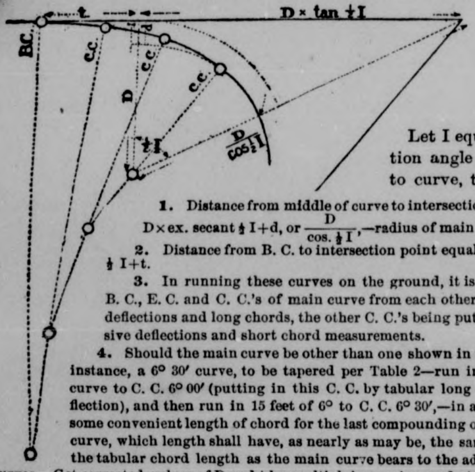
FOR TABLE ½.

10-4-02—1M)

2 G 12

DIAGRAM

Showing "D," "d," "t," of Tapering-curve Tables.



Let I equal intersection angle of tangents to curve, then :—

1. Distance from middle of curve to intersection point equals D × ex. secant ½ I + d, or $\frac{D}{\cos. \frac{1}{2} I}$,—radius of main curve.

2. Distance from B. C. to intersection point equals D × tangent ½ I + t.

3. In running these curves on the ground, it is best to fix the B. C., E. C. and C. C.'s of main curve from each other by the proper deflections and long chords, the other C. C.'s being put in by successive deflections and short chord measurements.

4. Should the main curve be other than one shown in the tables—for instance, a 6° 30′ curve, to be tapered per Table 2—run in the tapering curve to C. C. 6° 00′ (putting in this C. C. by tabular long chord and deflection), and then run in 15 feet of 6° to C. C. 6° 30′,—in all cases taking some convenient length of chord for the last compounding of the tapering curve, which length shall have, as nearly as may be, the same relation to the tabular chord length as the main curve bears to the adjacent tabular curves. Get corrected values of D and t by multiplying cosine and sine of total curvature up to main curve by the difference of radii of main curve and of last branch of compound curve; subtract cosine product from D, and add sine product to t (as taken from the table for the last branch of the compound curve).

FOR TABLE I.

Degree of Main Curve.	"D."	"t."	Total Curvature in Tapering Curve at Each End of Main Curve.	"d,"= "D," less Radius of Main Curve.	Long Chord from B. C. of Taper to C. C. of Main Curve.
° ′			° ′		
1 00	5729.61	15.01	0 09	0.00	30.00
1 30	3819.80	30.00	0 27	0.06	60.00
2 00	2865.01	45.00	0 54	0.17	90.00
2 30	2292.24	60.00	1 30	0.37	120.00
3 00	1910.57	75.00	2 15	0.66	149.99
3 30	1638.17	89.99	3 09	1.08	179.98
4 00	1434.10	104.98	4 12	1.63	209.95
4 30	1275.66	119.96	5 24	2.34	239.91
5 00	1149.22	134.92	6 45	3.22	269.84
5 30	1046.14	149.87	8 15	4.30	299.73
6 00	960.63	164.79	9 54	5.59	329.57
6 30	888.71	179.69	11 42	7.11	359.35
7 00	827.53	194.54	13 39	8.89	389.03
7 30	775.02	209.35	15 45	10.94	418.61
8 00	729.62	224.10	18 00	13.28	448.05
8 30	690.14	238.78	20 24	15.92	477.33
9 00	655.66	253.38	22 57	18.88	506.41
9 30	625.47	267.88	25 39	22.18	535.25
10 00	598.97	282.27	28 30	25.83	563.82

RADII FOR 50 FEET CHORDS.

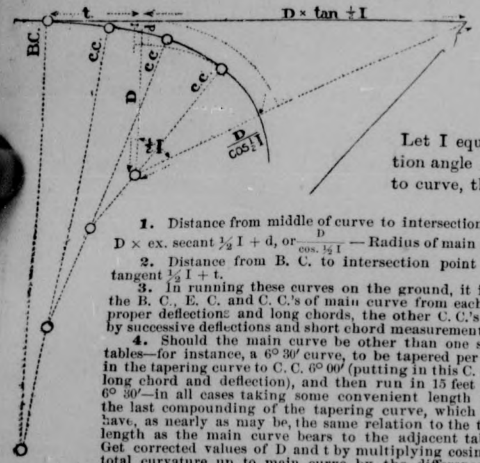
Degree.	Radius.	Degree.	Radius.
° ′		° ′	
0 30	11459.166	10 30	545.865
1 00	5729.608	11 00	521.071
1 30	3819.742	11 30	498.433
2 00	2864.837	12 00	477.683
2 30	2291.876	12 30	458.594
3 00	1909.913	13 00	440.973
3 30	1637.086	13 30	424.659
4 00	1432.468	14 00	409.510
4 30	1273.321	14 30	395.407
5 00	1146.006	15 00	382.245
5 30	1041.841	15 30	369.932
6 00	955.041	16 00	358.390
6 30	881.592	16 30	347.547
7 00	818.639	17 00	337.343
7 30	764.080	17 30	327.723
8 00	7[illegible].843	18 00	318.637
8 30	674.222	18 30	310.043
9 00	636.784	19 00	3[illegible].902
9 30	603.286	19 30	294.179
10 00	573.139	20 00	286.843

TABLE I. TAPERING CURVES—CHANGING 0° 30′ EACH 30 FEET.

TRANSIT AT	DEFLECTIONS TO																			
	B. C. 0° 30′	C. C. 1° 00′	C. C. 1° 30′	C. C. 2° 00′	C. C. 2° 30′	C. C. 3° 00′	C. C. 3° 30′	C. C. 4° 00′	C. C. 4° 30′	C. C. 5° 00′	C. C. 5° 30′	C. C. 6° 00′	C. C. 6° 30′	C. C. 7° 00′	C. C. 7° 30′	C. C. 8° 00′	C. C. 8° 30′	C. C. 9° 00′	C. C. 9° 30′	C. C. 10° 00′
° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
B. C. 0 30	.....	0 04½	0 11¼	0 21	0 33¾	0 49½	1 08¼	1 30	1 54¾	2 22½	2 53¼	3 27	4 03¾	4 43½	5 26	6 11¾	7 00¼	7 52	8 46½	9 44
C. C. 1 00	0 04½	.....	0 09	0 20¼	0 34½	0 51¾	1 12	1 35¼	2 01½	2 30¾	3 03	3 38½	4 16½	4 57¾	5 41¾	6 29	7 19¼	8 12¼	9 08¼	10 07½
C. C. 1 30	0 15¾	0 09	.....	0 13½	0 29¼	0 48	1 09¾	1 34½	2 02¼	2 33	3 06¾	3 43½	4 23¼	5 06	5 51½	6 40¼	7 32	8 26½	9 24¼	10 24¾
C. C. 2 00	0 33	0 24¾	0 13½	.....	0 18	0 38¼	1 01½	1 27¾	1 57	2 29¼	3 04½	3 42¾	4 24	5 08¼	5 55½	6 45½	7 38¾	8 35	9 34	10 36
C. C. 2 30	0 56¼	0 46½	0 33¾	0 18	.....	0 22½	0 47¼	1 15	1 45¾	2 19½	2 56¼	3 36	4 18¾	5 04½	5 53¼	6 45	7 39½	8 37½	9 37¾	10 41½
C. C. 3 00	1 25½	1 14¼	1 00	0 42¾	0 22½	.....	0 27	0 56¼	1 28½	2 03¾	2 42	3 23¼	4 07½	4 54¾	5 45	6 38¼	7 34¼	8 33½	9 35¾	10 40¾
C. C. 3 30	2 00¾	1 48	1 32¼	1 13½	0 51¾	0 27	.....	0 31½	1 05¼	1 42	2 21¾	3 04½	3 50¼	4 39	5 30¾	6 25½	7 23¼	8 23¾	9 27½	10 34
C. C. 4 00	2 42	2 27¾	2 10½	1 50¼	1 27	1 00¾	0 31½	.....	0 36	1 14¼	1 55½	2 39¾	3 27	4 17¼	5 10½	6 06¾	7 06	8 08	9 13¼	10 21½
C. C. 4 30	3 29¼	3 13½	2 54¾	2 33	2 08¼	1 40½	1 09¾	0 36	.....	0 40½	1 23¼	2 09	2 57¾	3 49½	4 44¼	5 42	6 42¾	7 46½	8 53	10 02¾
C. C. 5 00	4 22½	4 05¼	3 45	3 21¾	2 55½	2 26¼	1 54	1 18¾	0 40½	.....	0 45	1 32¼	2 22½	3 15¾	4 12	5 11¼	6 13½	7 18¾	8 27	9 38
C. C. 5 30	5 21¾	5 03	4 41¼	4 16½	3 48¾	3 18	2 44¼	2 07½	1 27¾	0 45	.....	0 49½	1 41¼	2 36	3 33¾	4 34½	5 38¼	6 45	7 54¾	9 07½
C. C. 6 00	6 27	6 06¾	5 43½	5 17¼	4 48	4 15¾	3 40½	3 02¼	2 21	1 36¾	0 49½	.....	0 54	1 50¼	2 49½	3 51¾	4 57	6 05¼	7 16½	8 30¾
C. C. 6 30	7 38¼	7 16½	6 51¾	6 24	5 53¼	5 19½	4 42¾	4 03	3 20¼	2 34½	1 45¾	0 54	.....	0 58½	1 59¼	3 03	4 09¾	5 19½	6 32¼	7 48
C. C. 7 00	8 55½	8 32¼	8 06	7 36¾	7 04½	6 29¼	5 51	5 09¾	4 25½	3 38¼	2 48	1 54¾	0 58½	.....	1 03	2 08¼	3 16½	4 27¾	5 42	6 59½
C. C. 7 30	10 19	9 54¼	9 26½	8 55½	8 21¾	7 45	7 05¼	6 22½	5 36¾	4 48	3 56¼	3 01½	2 03¾	1 03	.....	1 07½	2 17¼	3 30	4 45¾	6 04½
C. C. 8 00	11 48¼	11 22	10 52¾	10 20½	9 45	9 06¾	8 25½	7 41¼	6 54	6 03¾	5 10½	4 14¼	3 15	2 12¾	1 07½	.....	1 12	2 26¼	3 43½	5 03¾
C. C. 8 30	13 23¾	12 55¾	12 25	11 51¼	11 14¼	10 34¾	9 51¾	9 06	8 17¼	7 25½	6 30¾	5 33	4 32¼	3 28½	2 21¾	1 12	.....	1 16½	2 35¼	3 57
C. C. 9 00	15 05	14 35¾	14 03½	13 28	12 49¾	12 08½	11 24¼	10 37	9 46½	8 53¼	7 57	6 57¾	5 55½	4 50¼	3 42	2 30¾	1 16½	.....	1 21	2 44¼
C. C. 9 30	16 52½	16 21¾	15 47¾	15 11	14 31¼	13 48¼	13 02½	12 13¾	11 22	10 27	9 29¼	8 28½	7 24¾	6 18	5 08¼	3 55½	2 39¾	1 21	.....	1 25½
C. C. 10 00	18 46	18 13¾	17 38¼	17 00	16 18½	15 34¼	14 47	13 56½	13 03¼	12 07	11 07½	10 05¼	9 00	7 51¾	6 40½	5 26¼	4 09	2 48¾	1 25½	.....

DIAGRAM

Showing "D," "d," "t," of Tapering-Curve Tables.



Let I equal intersection angle of tangents to curve, then:—

1. Distance from middle of curve to intersection point equals D × ex. secant ½ I + d, or $\frac{D}{\cos. \frac{1}{2} I}$ — Radius of main curve.

2. Distance from B. C. to intersection point equals D × tangent ½ I + t.

3. In running these curves on the ground, it is best to fix the B. C., E. C. and C. C.'s of main curve from each other by the proper deflections and long chords, the other C. C.'s being put in by successive deflections and short chord measurements.

4. Should the main curve be other than one shown in the tables—for instance, a 6° 30′ curve, to be tapered per Table 2—run in the tapering curve to C. C. 6° 00′ (putting in this C. C. by tabular long chord and deflection), and then run in 15 feet of 6° to C. C. 6° 30′—in all cases taking some convenient length of chord for the last compounding of the tapering curve, which length shall have, as nearly as may be, the same relation to the tabular chord length as the main curve bears to the adjacent tabular curves. Get corrected values of D and t by multiplying cosine and sine of total curvature up to main curve by the difference of radii of main curve and of last branch of compound curve; subtract cosine product from D, and add sine product to t (as taken from the table for the last branch of the compound curve

TABLE 2.

TAPERING CURVES—CHANGING 1° 00′ TO EACH 30 FEET.

Transit at	—DEFLECTIONS TO—									
	B.C. 1°	C.C. 2°	C.C. 3°	C.C. 4°	C.C. 5°	C.C. 6°	C.C. 7°	C.C. 8°	C.C. 9°	C.C. 10°
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
B. C. 1°	....	0 09	0 22½	0 42	1 07½	1 39	2 16½	3 00	3 49½	4 45
C. C. 2°	0 09	....	0 18	0 40½	1 09	1 43½	2 24	3 10½	4 03	5 01½
C. C. 3°	0 31½	0 18	....	0 27	0 58½	1 36	2 19½	3 09	4 04½	5 06
C. C. 4°	1 06	0 49½	0 27	....	0 36	1 16½	2 03	2 55½	3 54	4 58½
C. C. 5°	1 52½	1 33	1 07½	0 36	....	0 45	1 34½	2 30	3 31½	4 39
C. C. 6°	2 51	2 28½	2 00	1 25½	0 45	....	0 54	1 52½	2 57	4 07½
C. C. 7°	4 01½	3 36	3 04½	2 27	1 43½	0 54	....	1 03	2 10½	3 24
C. C. 8°	5 24	4 55½	4 21	3 40½	2 54	2 01½	1 03	....	1 12	2 28½
C. C. 9°	6 58½	6 27	5 49½	5 06	4 16½	3 21	2 19½	1 12	....	1 21
C. C. 10°	8 45	8 10½	7 30	6 43½	5 51	4 52½	3 48	2 37½	1 21	....

FOR TABLE 2.

Degree of Main Curve.	"D."	"t."	Total Curvature in Tapering Curve at Each End of Main Curve.	"d,"= "D," less Radius of Main Curve.	Long Chord from B. C. of Taper to C. C. of Main Curve.
			° ′		
2°....	2864.87	15.00	0 18	0 03	30.00
3°....	1910.06	30.00	0 54	0.14	60.00
4°...	1432.85	45.00	1 48	0.38	90.00
5°....	1146.78	60.00	3 00	0.77	119.99
6°....	956.40	74.99	4 30	1.36	149.96
7°....	820.82	89.95	6 18	2.18	179.91
8°....	719.62	104.90	8 24	3.28	209.81
9°....	641.47	119.80	10 48	4.69	239.63
10° ..	579.59	134.66	13 30	6.45	269.35

RADII FOR 50 FEET CHORDS.

Degree.	Radius.	Degree	Radius.
° ′		° ′	
1 00..	5729.61	6 00	955.04
1 30..	3819.74	6 30	881.59
2 00..	2864.84	7 00	818 64
2 30..	2291.88	7 30	764.08
3 00..	1909.91	8 00	716.34
3 30..	1637.09	8 30	674.22
4 00..	1432.47	9 00	636.78
4 30..	1273.32	9 80	603.29
5 00..	1146.01	10 00	573.14
5 30..	1041.84	......	......

TABLE I.

TAPERING CURVES.

CHANGING 0° 30′ EACH 30 FEET.

Transit at	—DEFLECTIONS TO—					
	B. C. 0° 30′	C. C. 1° 00′	C. C. 1° 30′	C. C. 2° 00′	C. C. 2° 30′	C. C 3° 00′
° ′	° ′	° ′	° ′	° ′	° ′	° ′
B.C. 0 30	....	0 4½	0 11¼	0 21	0 33¾	0 49½
C.C. 1 00	0 04½	....	0 09	0 20¼	0 34½	0 51¾
C.C. 1 30	0 15¾	0 09	....	0 13½	0 29¼	0 48
C.C. 2 00	0 33	0 24¾	0 13½	....	0 18	0 38¼
C.C. 2 30	0 56¼	0 46½	0 33¾	0 18	....	0 22½
C.C. 3 00	1 25½	1 14¼	1 00	0 42¾	0 22½	....

FOR TABLE I.

Degree of Main Curve.	"D."	"t."	Total Curvature in Tapering Curve at Each End of Main Curve.	"d,"= "D," less Radius of Main Curve.	Long Chord from B. C. of Taper to C. C. of Main Curve.
° ′			° ′		
1 00	5729.61	15.00	0 09	0.00	30.00
1 30	3819.80	30.00	0 27	0.06	60.00
2 00	2865.01	45.00	0 54	0.17	90.00
2 30	2292.24	60.00	1 30	0.37	120.00
3 00	1910.57	75.00	2 15	0.66	149.99

TABLE 3.

TAPERING CURVES.

CHANGING 2° 30′ TO EACH 30 FEET.

Transit at	—DEFLECTIONS TO—							
	B. C. 2° 30′	C. C. 5° 00′	C. C. 7° 30′	C. C. 10° 00′	C. C. 12° 30′	C. C. 15° 00′	C. C. 17° 30′	C. C. 20° 00′
° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
B.C. 2 30	....	0 22½	0 56¼	1 45	2 48¾	4 07½	5 41	7 29½
C.C. 5 00	0 22½	....	0 45	1 41¼	2 52½	4 18¾	6 00	7 56
C.C. 7 30	1 18¾	0 45	....	1 07½	2 26¼	4 00	5 48¾	7 52½
C.C.10 00	2 45	2 03¾	1 07½	....	1 30	3 11¼	5 07½	7 18¾
C.C.12 30	4 41¼	3 52½	2 48¾	1 30	....	1 52½	3 56¼	6 15
C.C.15 00	7 07½	6 11¼	5 00	3 33¾	1 52½	...	2 15	4 41¼
C.C.17 30	10 04	9 00	7 41¼	6 07½	4 18¾	2 15	....	2 37½
C.C.20 00	13 30½	12 19	10 52½	9 11¼	7 15	5 03¾	2 37½	....

FOR TABLE 3.

Degree of Main Curve.	"D."	"t."	Total Curvature in Tapering Curve at Each End of Main Curve.	"d,"= "D," less Radius of Main Curve.	Long Chord from B. C. of Taper to C. C. of Main Curve.
° ′			° ′		
5 00	1146.11	15.00	0 45	0.10	30.00
7 30	764.48	29.99	2 15	0.40	60.00
10 00	574.12	44.97	4 30	0.99	89.98
12 30	460.56	59.93	7 30	1.97	119.9[illegible]
15 00	385.68	74.82	11 15	3.43	149.76
17 30	333.20	89.62	15 45	5.48	179.43
20 00	295.04	104.27	21 00	8.20	208.80

TABLE 4.

TAPERING CURVES.

CHANGING 2° 30′ TO EACH 15 FEET.

Transit at	—DEFLECTIONS TO—							
	B. C. 2° 30′	C. C. 5° 00′	C. C 7° 30′	C. C. 10° 00′	C. C. 12° 30′	C. C. 15° 00′	C. C. 17° 30′	C. C. 20° 00′
° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
B. C. 2 30	....	0 11¼	0 28⅛	0 52½	1 24⅜	2 03¾	2 50⅝	3 45
C. C. 5 00	0 11¼	....	0 22½	0 50⅝	1 26¼	2 09⅜	3 00	3 58⅛
C. C. 7 30	0 39⅜	0 22½	....	0 33¾	1 13⅛	2 00	2 54⅜	3 56¼
C. C. 10 00	1 22½	1 01⅞	0 33¾	....	0 45	1 35⅝	2 33¾	3 39⅜
C. C. 12 30	2 20⅝	1 56¼	1 24⅜	0 45	....	0 56¼	1 58⅛	3 07½
C. C. 15 00	3 33¾	3 05⅝	2 30	1 46⅞	0 56¼	....	1 07½	2 20⅝
C. C. 17 30	5 01⅞	4 30	3 50⅝	3 03¾	2 09⅜	1 07½	....	1 18¾
C. C. 20 00	6 45	6 09⅜	5 26¼	4 35⅝	3 37½	2 31⅞	1 18¾	....

FOR TABLE 4.

Degree of Main Curve.	"D."	"t."	Total Curvature in Tapering Curve at Each End of Main Curve.	"d,"= "D," less Radius of Main Curve.	Long Chord from B. C. of Taper to C. C. of Main Curve.
° ′			° ′		
5 00	1146.03	7.50	0 22½	0.02	15.00
7 30	764.18	15.00	1 07½	0.10	30.00
10 00	573.38	22.50	2 15	0.24	45.00
12 30	459.08	29.99	3 45	0.49	59.9[illegible]
15 00	383.10	37.47	5 37½	0.86	74.97
17 30	329.09	44.94	7 52½	1.37	89.93
20 00	288.90	52.39	10.30	2.06	104.85

– Sacramento Southern Railway. –

– Sacramento - Walnut Grove –

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" House	"	37
Topography Courtland Townsite	"	25 - 26

0192

"T" LINE. Preliminary Oct: 25/05.

Mag: Course

871+00 △ 0°46' R.

S 31°15' W

869+10 △ 11°54' R.

S. 19°20' W

866+00 △ 3°30' R.

863+00 △

S 15°50' W

859+40 △ 9°56' R.

S 5°55' W

858+00 △ 11°28' R.

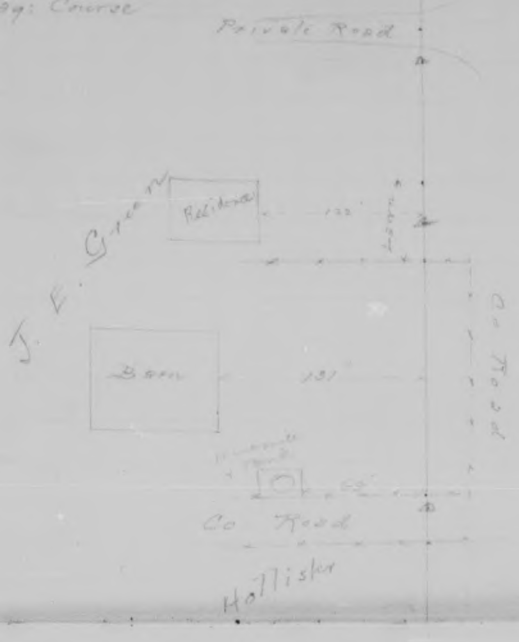
S 5°40' E.

T. 852+46.1 } Prelim: 67°40' L.
=
E 852+46.1 } Pt on Tan.

S. 62°10' W.

"T" LINE Preliminary Oct 25/05

		Angle	Mag: Course
+55			
885+40	△		
884+85	Edge of Lawn		
884+23	△		
884+18	Garden Fence		
881+84	Fence		
881+82	△		
881+44	Fence		
			S 27°20' W
880+50	△	4°40' L	
877+50	△		
875+00	△		
			S. 32° W



Mrs Nannie

"T" LINE Preliminary Oct 25/05

908 + 55. Fence				
907 + 32	△			△
			S 39° 25' W	
898 + 25	△	8° 40' L.		
897			Sep House 136	
			S 48° 00' W.	
892 + 60	△	5° 20' R.		△
			S 42° 45' W	
889 + 80	△	10° 00' R.		△
			S 32° 45' W	
888 + 00	△	5° 20' R.		△

"T" LINE "Preliminary"

B.J Van [illegible] Oct 25/05

928 + 45 △

S 69° 10' W

921 + 80 △ 9° 54' R.

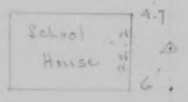
S 59° 15' W

913 + 00 △ 4° 20' R.

S 54° 45' W

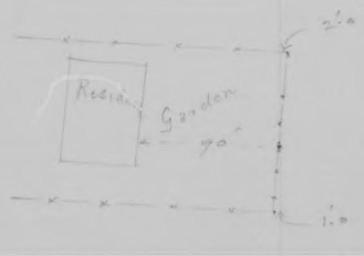
910 + 20 △ 15° 20' R.

908 + 90. 6 △
+ 75.5



"T" Line Preliminary Oct. 25/05

E 1001+29.3 953+68.5	} E.C.		
948+46	△	31°18½' L.	
948+00	△		N 87°40' W
941+70	△	15°12' R.	
			S. 77°15' W
934+80	△	8°04' R.	
932+80	△		
930+00	△		
929+66			
929			
928+75.7	Fence		



"T" LINE Preliminary Oct25/05

E 1012+62.8 △BC △

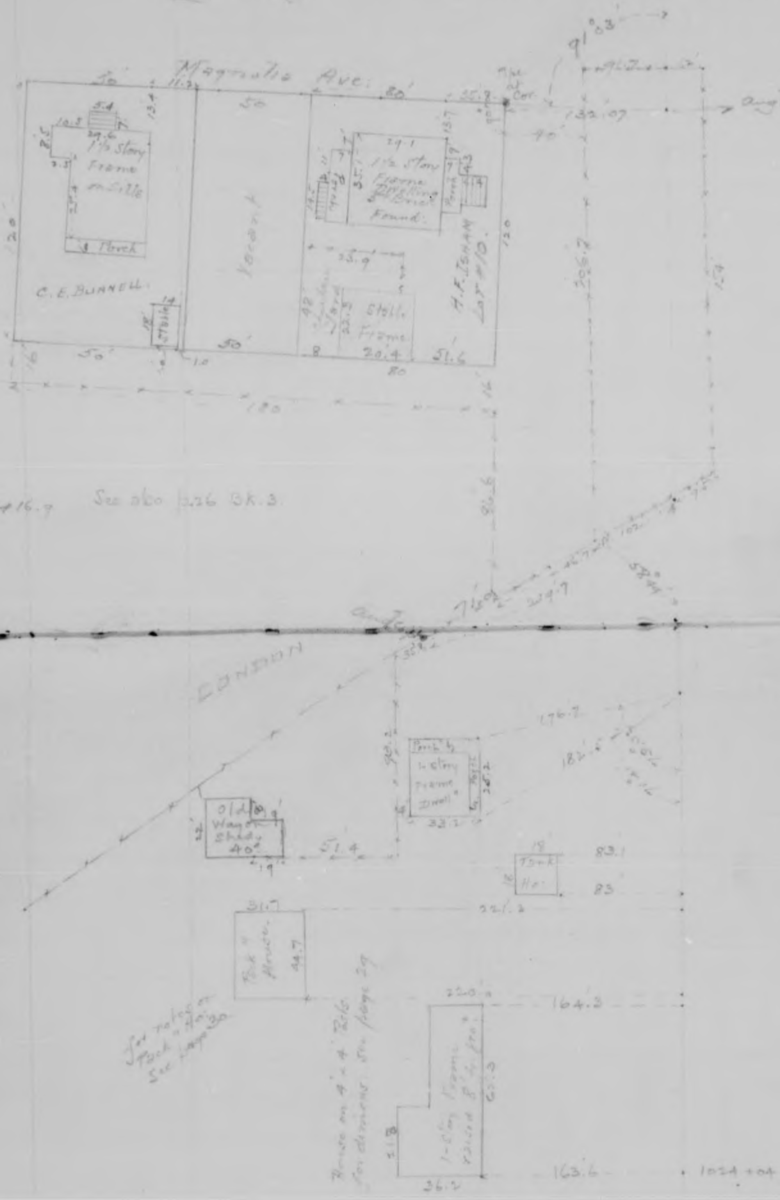
E 1007+43.9△ 1°34' R. △

T 953+86 △ 37°35' L. △

St/2 Topography Courtland Townsite Oct 8/08

1029+75

1029+68.2



P'sty Line 1028+16.9 See also p.26 Bk.3

1026+67

1025+69

1025+66.5

For notes on Pack House See page 30

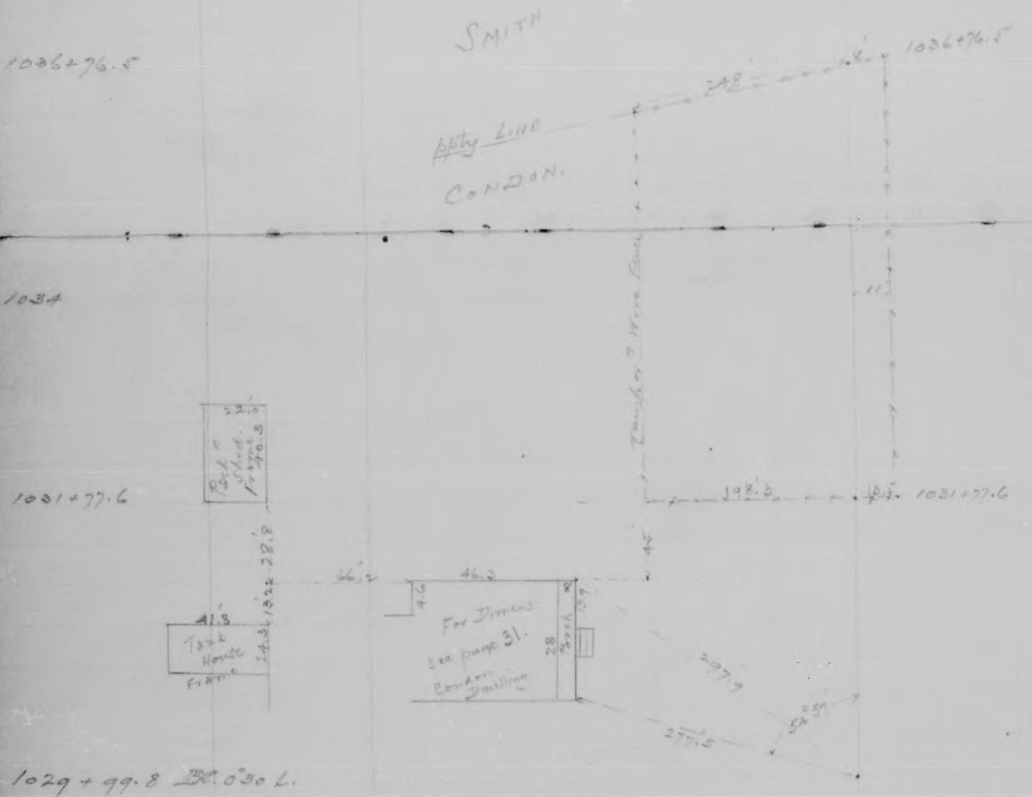
House on 4'×4' Posts for dimensions see page 29

1024+04

Sta. Topography Courtland Townsite

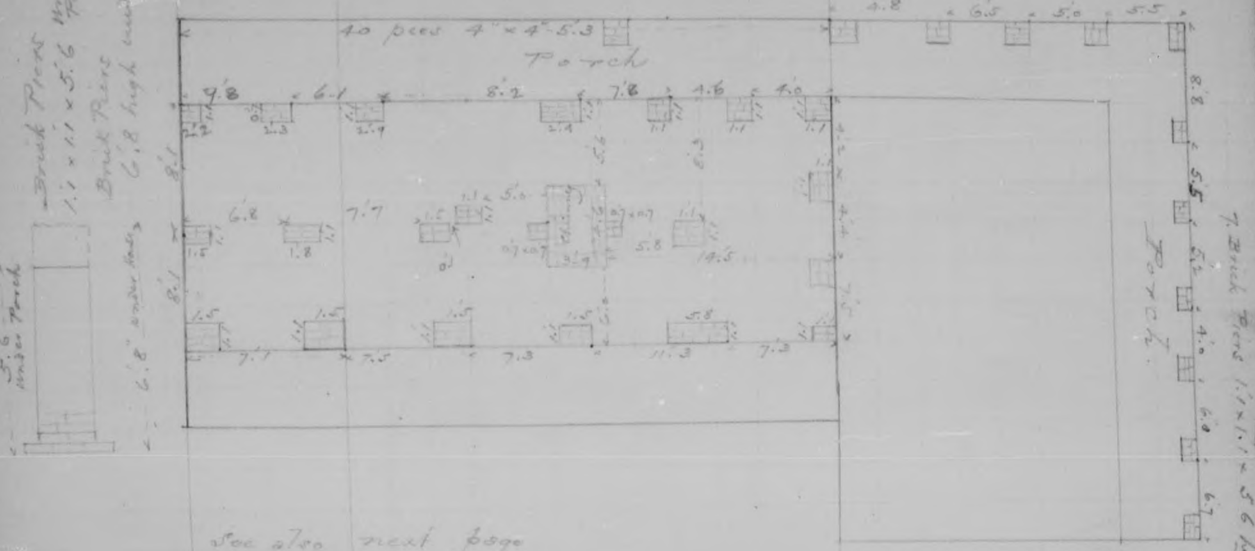
Oct 8/08

for Location Notes
See Books #3 + 7



F. Bates' House

5 Brick Piers 1.1 x 1.1 x 5.6

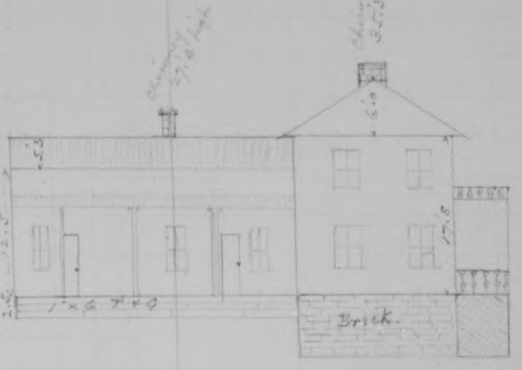


See also next page

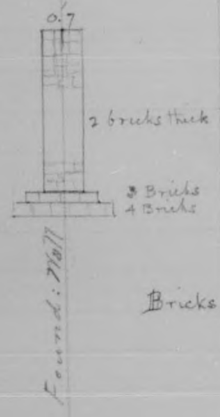
Sta
1026.

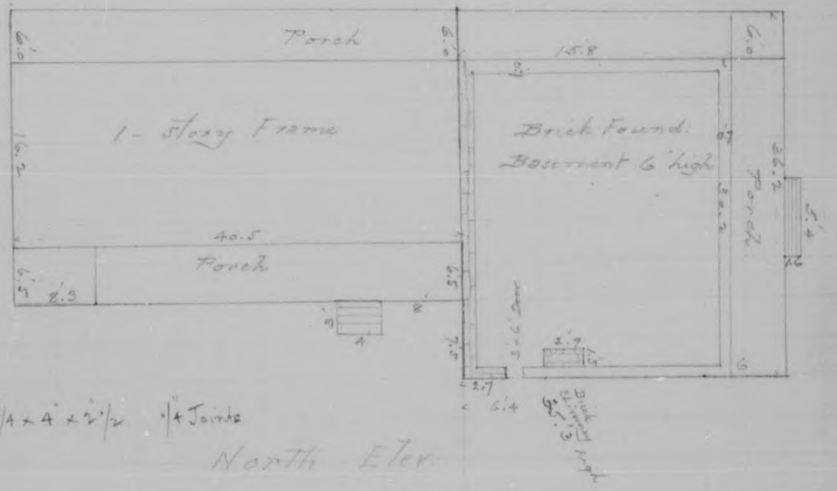
F. Bates' House

This is a very old house
Mr Bates will probably provide
new bricks for foundation, present
ones are in very poor condition.
House to be moved N. 23.3 + East 80.5
Main House Plastered



North Elev.





Bricks 8 1/4 x 4" x 2 1/2 1/4 Joints

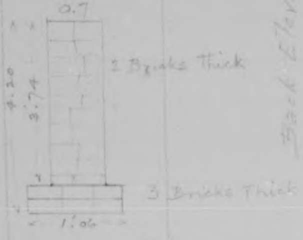
North Elev.

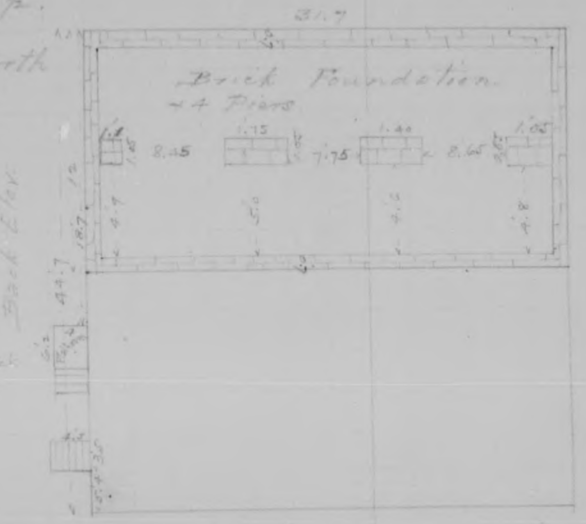
St.
1028

F. Bates Packing House

Bricks in Foundation 8¼ × 4" × 2¼
Vertical Joints 3/16"
Horizontal " ½".

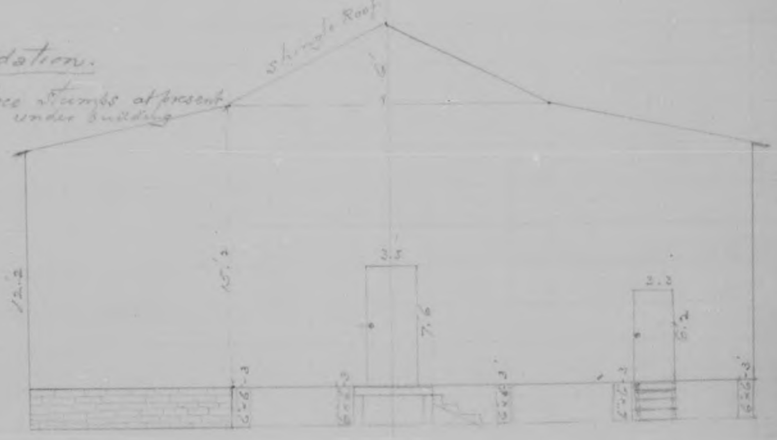
House to be moved 178' North
and 184' East.





Bricks in Found. & piers are
very poor.

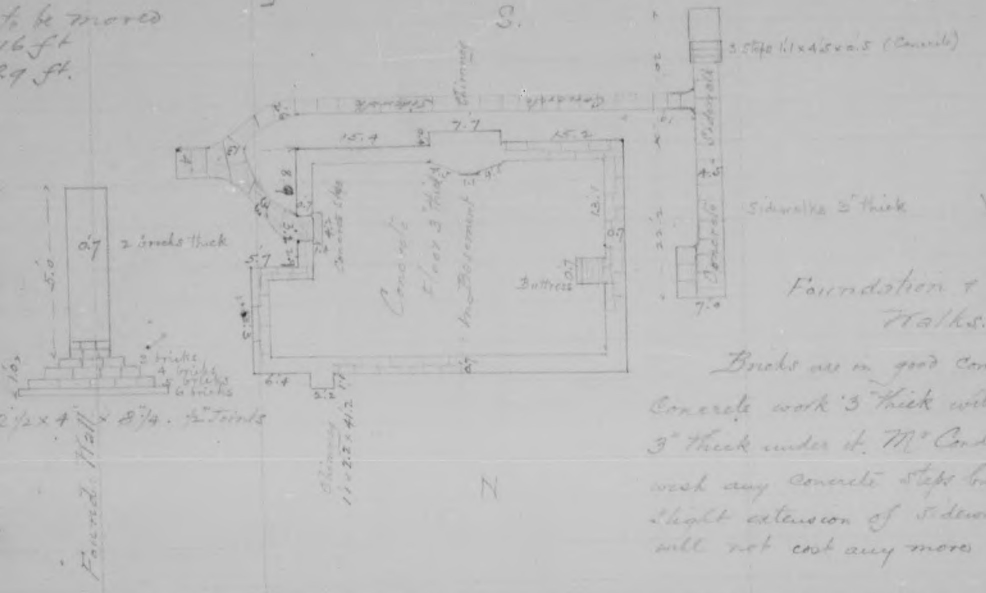
Material req^d for new Foundation.
17 pces 6" × 6" – 3 posts, to replace stumps at present under building
100 Lin. ft 3" × 12" – Footings.



Back Elev.

Geo: Condon's Residence. Sep: 1930.

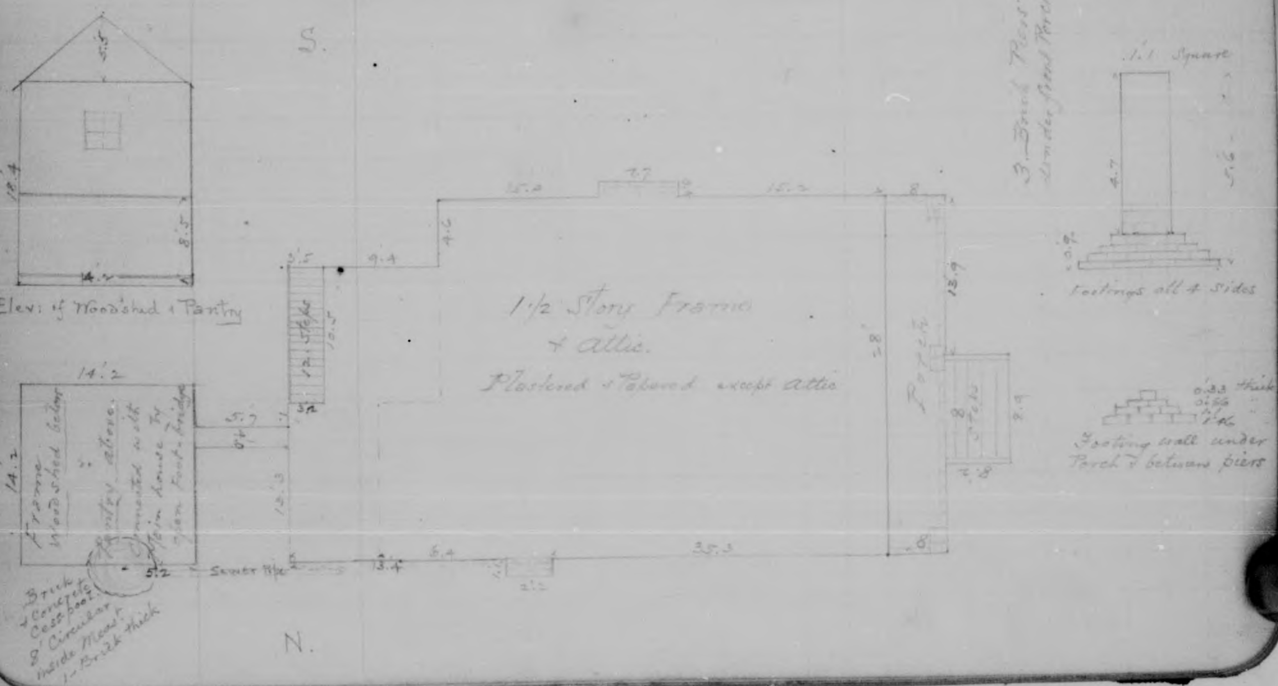
House to be moved
East 216 ft
South 29 ft.



Bricks 2½ x 4" x 8¼. ½" Joints

Foundation & Concrete Walks.

Bricks are in good condition. All Concrete work 3" thick with crushed rock 3" thick under it. Mr Condon does not wish any Concrete Steps but wants a slight extension of Sidewalks, but same will not cost any more than steps.



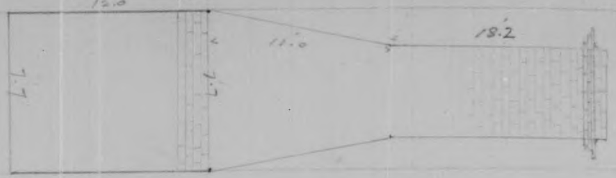
Nº Elev: of Woodshed & Pantry

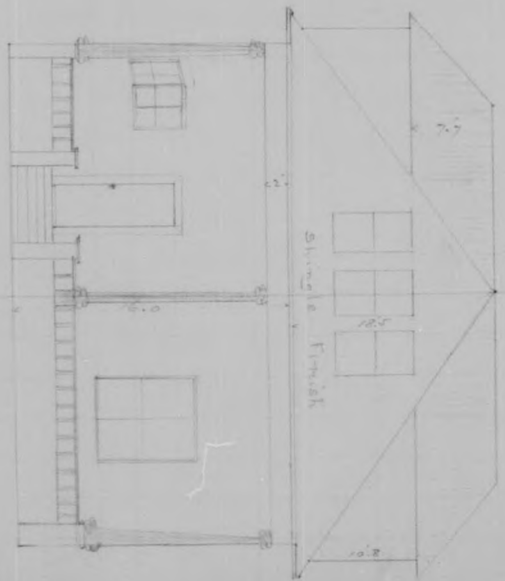
3. Brick Piers under front Porch.

Footings all 4 sides

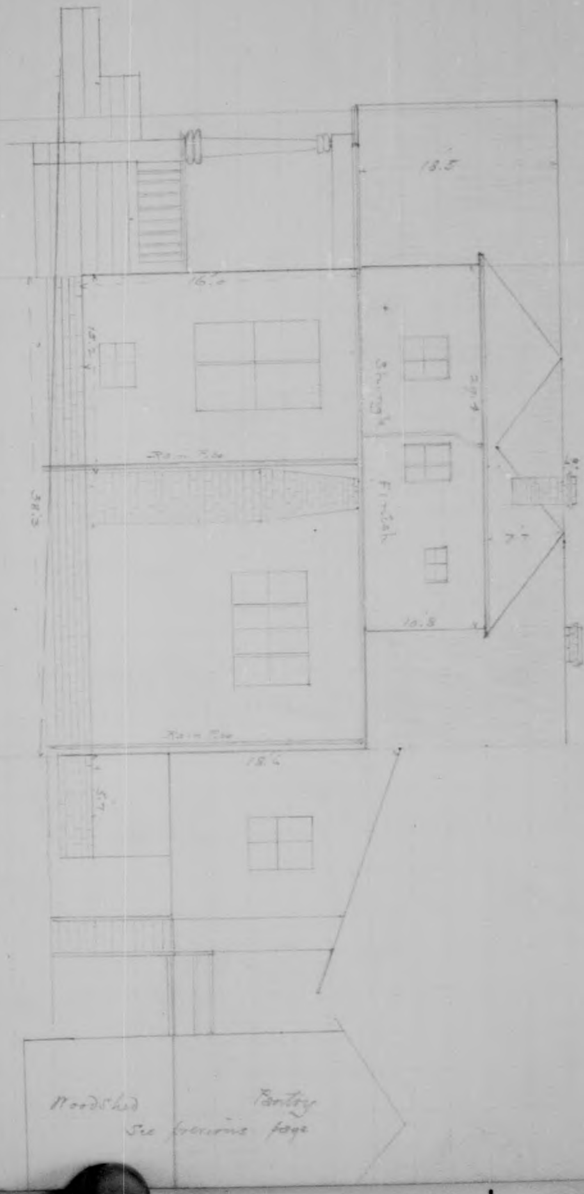
Footing wall under Porch & between piers

Section of South Chimney 41.2 high.



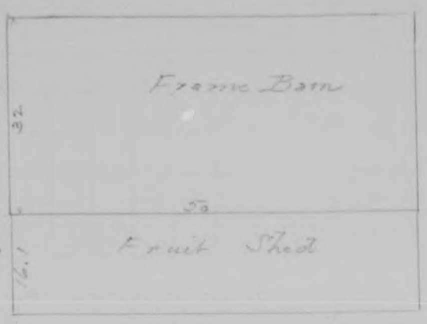


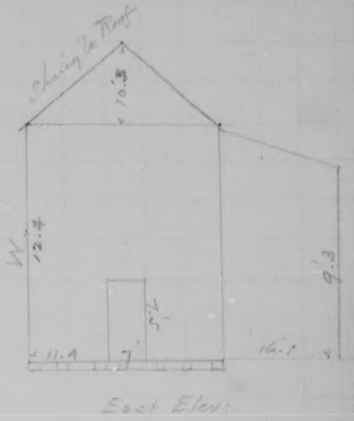
Geo: Condon's Residence



S½.
1364.

Locke's Barn





Barn is in Fair Condition and has only one row of 7 posts under East end. When moved will require 56 pces 6"x6-1'long for posts, and 56 pces 3"x12"-2' long for footings

For fruit shed 6 pces 4"x6"-10' for Posts

Barn in present location sets on the ground except at East End but when moved will set on level ground therefore new underpinning will be required.

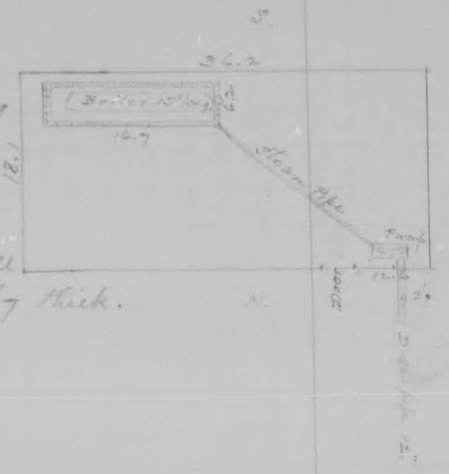
S/2
13-7-5

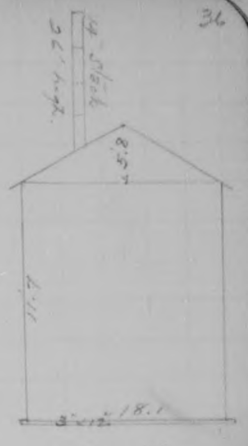
Locke's Pump House

Corrugated Iron Building never been used. Building sets on 3" x 12" Sills laid on scattering bricks.

Pump & Boiler are apparently in good condition.

Boiler is encased by Brick wall 16.7 long. 6.2 wide & 6.5 high 0.7 thick.

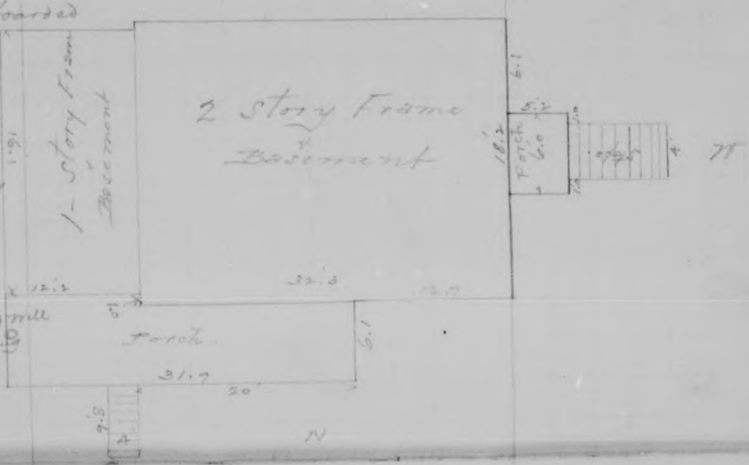


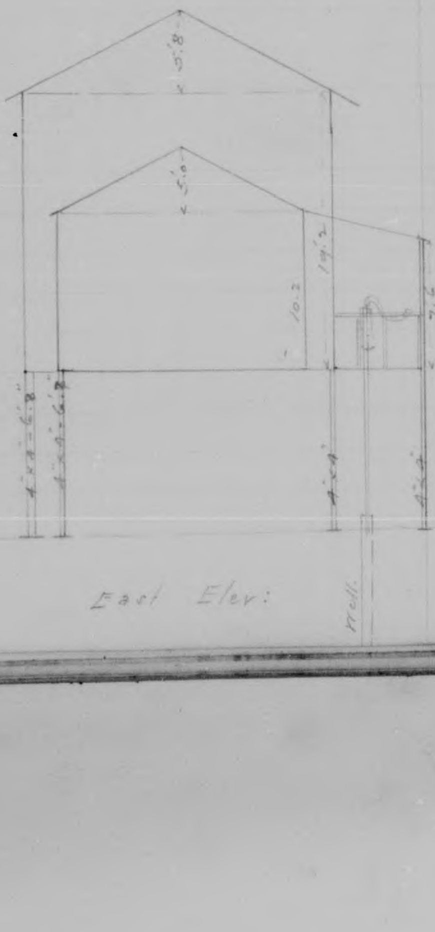


East Elev.

Sta: Locke's House.

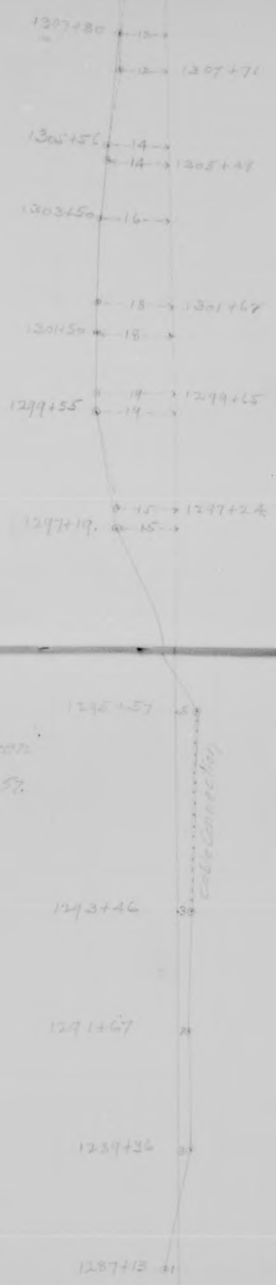
House is in poor Condition being an old house
it sets on 4"x 4 Posts, + Basement is used
as a Fruit House. It is boarded
up on N. S + W. sides.
House is empty + not been
used except as Warehouse
for some time. Underpinning
Can be used again, but
if house has to be torn
down + moved away
will be little
value to re-erect.



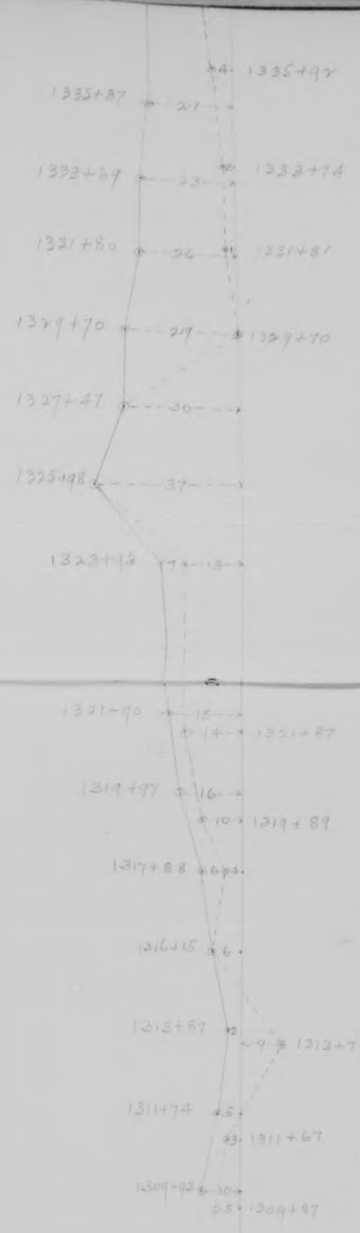


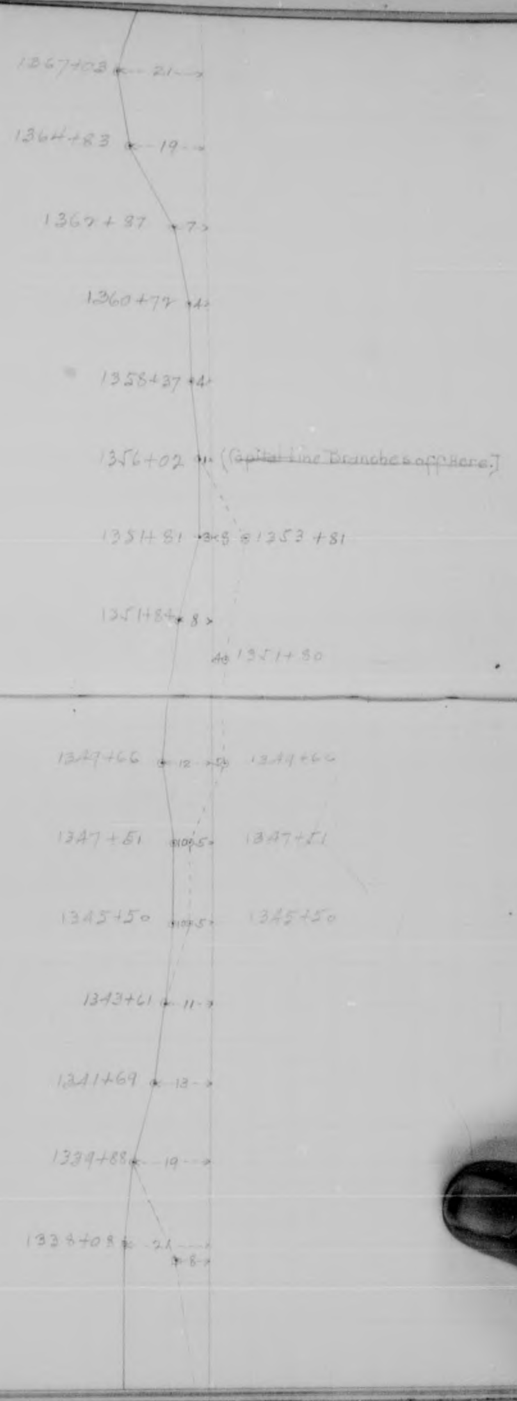
East Elev:

Telephone Line Location.



Note: Cable Connection between
Sta 1293+46 & 1295+57.


4 1335+97
1335+87 21
1333+69 23 1333+74
1331+80 26 1331+81
1329+70 29 1329+70
1327+47 30
1325+98 37
1323+93 7 13
1321+90 15
14 1321+87
1319+97 16
10 1319+89
1317+88 6 4
1316+15 6
1313+87 2
9 1313+79
1311+74 5
3 1311+67
1309+93 10
5 1309+97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1358+37
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1356+02
(~~Capital Line~~ Branches off Here.]
1354+81
3
8
1353+81
1351+84
8
46
1351+80
1349+66
12
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1349+66
1347+51
10
5
1347+51
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13
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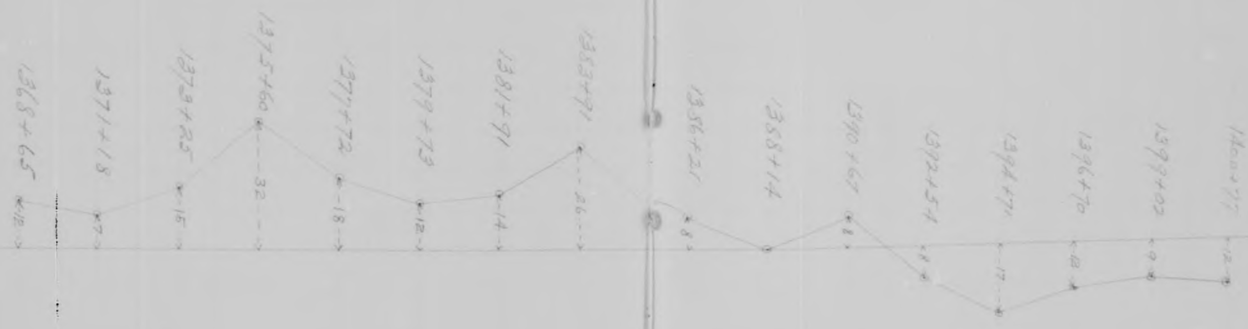
1338+08
21
8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1371+18
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1375+60
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1377+72
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1379+73
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1383+91
26
1386+21
8
1388+14
1390+67
8
1392+54
11
1394+71
17
1396+70
12
1397+02
9
1400+77
12

(3-20 02—1M) 2 G 199

SOUTHERN PACIFIC CO.

(PACIFIC SYSTEM)

Engineering Department.

INSTRUCTIONS TO TRANSITMEN.

1.—See that transit plummet and line are well protected from air currents while being adjusted to the angle point.

2.—No instrument station must be in such a position as to prevent the line of sights for Backsights or Foresights striking within two inches or less of the point of the rod.

3.—Double-center all instrument points, checking each sight back, after setting the point on foresight.

4.—No sights are allowed longer than one thousand feet on tangents, or eight hundred feet, or forty-five degrees deflection, on curves.

5.—On taper curves, the B. C. or E. C. and C. C.'s of main curve must be put in from each other by one deflection and long chord, and not through the intermediate compound curve points.

6.—Check all angles by magnetic bearings of all courses, and take true meridian, at least once in ten miles, where practicable, in mountainous country, and once in twenty to fifty miles in open plains.

7.—A copy of alignment notes will be made out each evening on a traverse sheet, showing true (or assumed) bearings, and magnetic bearings, for use in mapping and for ready detection of errors in notes.

8.—All lines in mountainous country will be run with a 50-foot chain. In open country a 100-foot chain may be used on the tangents, and a 50-foot chain on all curves.

9.—On location lines, small pegs must be driven to the ground surface at each chain length, as well as the usual stakes. On preliminary lines, stakes only need be used, except at instrument points.

10.—Stakes must be well driven and fit to stand several years.

11.—Chainmen will use hand levels to determine the difference of height of the ends of the chain, and will use plummets on all rough ground. Chain must be stretched out nearly in line on rough ground before measuring the short successive distances, so as to use all parts of the chain instead of using one part repeatedly.

12.—All instrument stations put in at other points than at end of full chain must be measured in with steel tape and checked by chain. Where an instrument station is set at other point than at end of full chain, the next full chain station must be measured from the last one back of the instrument, and not from the instrument point.

13.—Chain must be tested once a day at least.

14.—All transit books must be paged and fully indexed.

(8-9-04—1M.) Form 3010

SOUTHERN PACIFIC CO.

ENGINEER'S DEPARTMENT

Instructions to Engineers in Charge of Field Parties

1. All Pay-Rolls and Vouchers are to be made out on the first day of each month, on the blanks furnished for that purpose, and forwarded to the Chief Engineer.

Give the Christian name and initial letter of a middle name on Payment Roll and Voucher.

Itemize all Vouchers, giving the date and place of disbursements; and when possible to do so, take receipt for all disbursements.

Time will be computed by calendar months and fractions of the same. A contribution of fifty cents will be expected from all employes (except Chinese) who have worked seven (7) days or more during each month and twenty-five cents for less than seven (7) days.

2. No time will be allowed men absent on private business. No time will be allowed any of the party, excepting those placed on duty by the Chief of party until the work for which they were engaged shall commence; nor will any time be allowed after the evening of the last day's work, excepting to those detailed as Teamsters, Cooks, or for other duty by the Chief of party or his Agent. Give to men discharged a certificate of the time and amount due them.

3. All men will be returned free to the place at which they were engaged for any particular survey—excepting by agreement to the contrary—unless discharged for disobedience or incompetency, or leaving without the full consent of the Chief of party, in which case traveling expenses will not be allowed. Ten (10) days' notice will be required from all employees, in order to leave the service in good standing, unless this requirement be waived by the Engineer in charge.

In case of sickness of any member of party entitled to Hospital treatment, the Chief of party must give a Hospital Certificate.

4. Books, Stationery, Instruments, and other property of the Company are to be kept in good order; the Chief of the party will be charged for the same, and he must return them in like order in which they were received, or satisfactorily account for their damage or loss.

5. All requisitions must be sent to the Chief Engineer by letter and the telegraph is not to be used for that purpose, unless writing would occasion delay or loss.

6. Note on first page of every field book a full description of the particular route, line and work to which the notes relate, and enter date of each day's work in the proper place.

7. Note name and address in each Transit Book, of all members of the party; and in the Level Book, name and address of Leveler and Rodman.

8. A journal must be kept, fully describing each day's work, and noting all information of interest, and how it was derived.

9. Monthly reports must be sent to the Chief Engineer on the first day of each month, giving the lengths and descriptions of the various lines run, and all work done, with such other information as may come within the knowledge of the engineer in charge, of which the Chief Engineer should be informed.

WILLIAM HOOD,
CHIEF ENGINEER.